Space Weather Technical Forecast

Issued on Friday, 08 April 2022 at 01:19 Local

This technical forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

Space Weather Forecast Headline: Chance of G1/Minor Geomagnetic Storms, mainly day 3 (10th).

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been Low over the past 24 hours, with a C1 flare at 07/0133 UTC. There are currently four sunspot regions on the visible disc. AR2978 (Cho/Beta), in the southwest, is the largest region on the disc. It has shown some signs of decay losing its intermediate spots and it has remained relatively stable with no noteworthy activity. AR2981 has decayed and has lost the spots in its trailing group. It is now classified Axx/alpha. AR2985 has simplified and is now classified Cro/Beta. There is also a new region in the southeast quadrant, AR2987 a simple Axx/alpha.

No Earth-directed CMEs have occurred in the last 24 hours, although there are a number of filaments visible on the Earth-facing disc that are being monitored for any potential eruption.
Solar Wind / Geomagnetic Activity: The solar wind, as measured by DSCOVR at L1, has been at slightly elevated levels, reaching a peak of 466 km/s at 07/0510 UTC. The solar wind density started and ended the day below average (<5 ppcc), while increasing to average values (5-10 ppcc) early morning to early afternoon. The interplanetary magnetic field (IMF) strength, Bt, was weak, below 8nT, with the north-south component between -7 and +5 nT, but spent much the period in a negative (southward) direction. The Phi angle was mainly negative (towards the Sun). Geomagnetic activity was Quiet to Active (Kp1- 4).

Energetic Particles / Solar Radiation: The high energy proton flux (10MeV) measured at GOES-16 at GEO was at background levels. The high energy (greater than 2MeV) electron flux was at Moderate to High levels, with a peak of 3200 pfu at 07/01330 UTC. The 24-hour corresponding fluence gradually declined, falling below the Active threshold (1e8 integrated pfu) at 07/2100 UTC. 7.79e7 integrated pfu was recorded at 08/0000 UTC.

Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity is expected to be predominantly Low to Very low, with only relatively small and simple sunspot regions currently on the disc.

Solar Wind / Geomagnetic Activity: The currently slightly elevated solar winds are expected to ease to mainly background levels through today. Then little change expected until tomorrow (9th April), when there is a slight chance of a glancing interaction from a CME which left the Sun around 04/2200 UTC, although this is very low confidence. Weak coronal hole influence from CH72 is also expected to arrive through the forecast period, most likely during day 3 (10th) and persisting day 4 (11th). Geomagnetic activity is forecast to be Quiet to Unsettled (Kp 1-3) today and also day 4 (11th), increasing Unsettled to Active (Kp 3-4) tomorrow and also day 3 (10th April), with a chance of G1/Minor Storms (Kp 5) during days 2 and 3 (8th and 9th).

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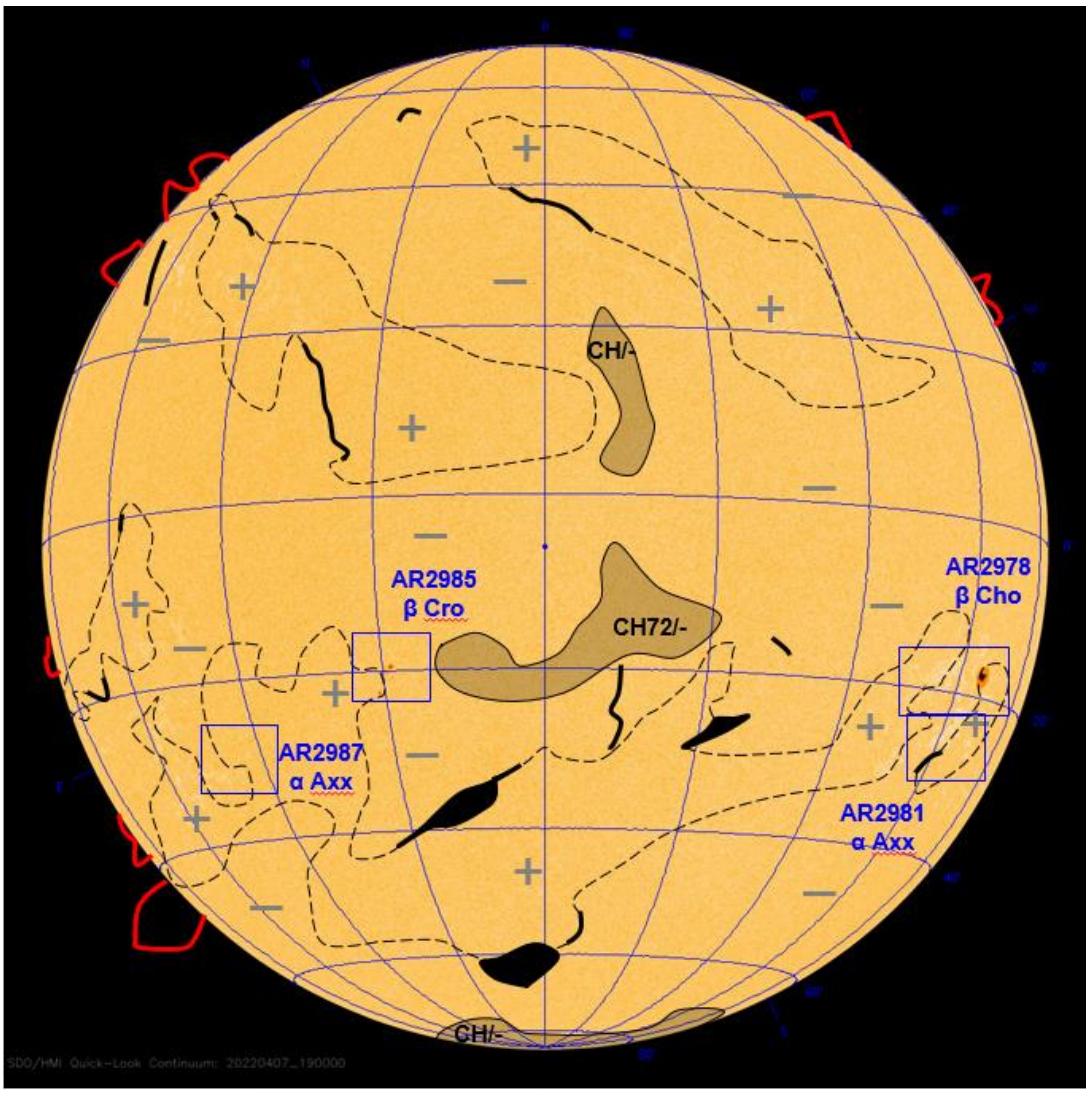
Energetic Particles / Solar Radiation: The high energy (greater than 10MeV) proton flux is expected to persist at background levels, with only a very slight chance of slight increases. The high energy (greater than 2 MeV) electron flux is likely to briefly breach the High threshold today at the peak of the diurnal cycle, but for most of the forecast period the flux is expected to be at Background to Moderate levels. However, a recovery in values is possible during day 4 (11th), with the flux again breaching the High threshold. The associated 24 hour fluence has fallen below the Active (1e8 integrated pfu) threshold and is expected to remain below through the forecast period, although with a rising trend through day 4 (11th).

Figure 1. Solar Analysis Valid 07/1900 UTC.



Key: Filament ___ , Prominence ___ , Magnetic Field Line - - - , Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α-β-βγ-βγδ and Zurich-McIntosh Axx etc.

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Geomagnetic Storms:

The next coronal hole enhancement is anticipated to arrive during the first half of day 3 (10th), from CH72/-. The solar wind is expected to increase to slightly elevated levels again, having fallen to background levels through today, with a chance of the solar wind becoming elevated later day 3 into day 4 (11th).

A CME which had been assessed as potentially arriving on day 3 (9th) has now been reassessed as likely missing, passing mostly to the south and east of the Earth. There remains uncertainty with this analysis however, and a glancing interaction cannot be ruled out later today (8th) and into day 3 (9th).

Geomagnetic activity is forecast to be Quiet to Unsettled (Kp 1-3) today and also day 4 (11th), increasing Unsettled to Active (Kp 3-4) tomorrow and also day 3 (10th April). There is a slight chance of a G1/Minor Storm interval (Kp 5) occurring tomorrow if the CME arrives, and a chance of a G1/Minor geomagnetic storm during the CIR and initial onset of the high speed stream during day 3.

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	10	20	40	20
Strong	G3	No	1	2	2	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X-Ray Flares:

There are currently four numbered sunspot regions on the visible disc: AR2978 in the southwest quadrant is the largest region on the disc, although this region continues to decay, with the previous intermediate spots disappearing. It appears to be relatively stable and has produced no noteworthy activity during the past 24 hours. AR2981 to the south of this region, has lost many of its trailing spots, is now a simple Axx/alpha and is close to disappearing. AR2985 in the southeast has also simplified, and is now a Cro/beta. There is a very small, simple and barely visible new region in the southeast quadrant which has been numbered as AR2987.

Solar activity is expected to remain Low or Very Low, with only a slight chance (5%) of increasing to Moderate. AR2978 is the most likely source of this activity, and therefore the risk reduces later in the period as this region rotates round the western limb. Currently no significant sunspots are expected to rotate onto the visible disc from the farside.

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)

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Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	No	5	5	2	1
Very Active	R3 to R5 X Class	No	1	1	1	1

Solar Radiation Storms - (High Energy Protons):

The high energy proton flux (greater than 10 MeV) as measured by GOES-16 at GEO is at background levels. It is expected to remain at this level during the forecast period, but there is a very slight risk of proton storms as AR2978 (currently the most complex sunspot region on the visible disc) rotates towards the west limb.

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	2	2	1	1
Very Active	≥ S3 *	No	1	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

High Energy Electrons Event (≥ 2MeV):

The high energy electron flux (greater than 2MeV), as observed by GOES-16 at GEO, has eased back to Moderate levels and is expected to persist at similar levels through much of the

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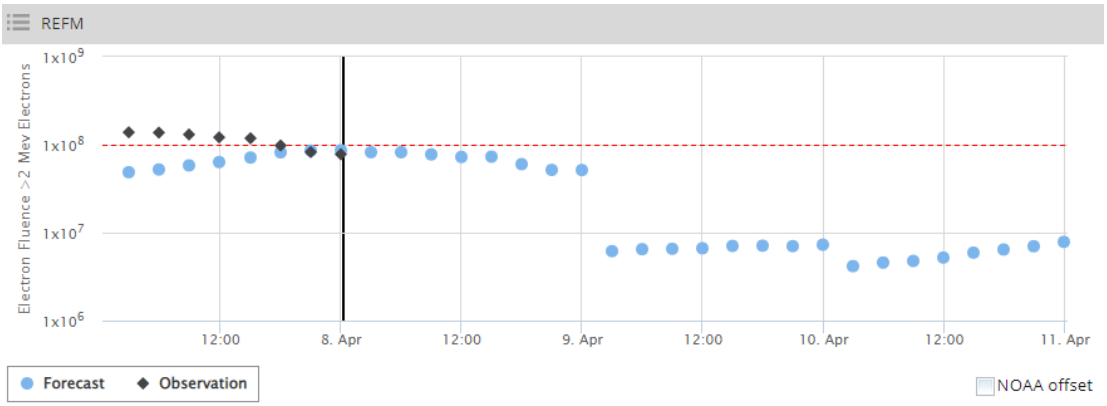
period. However, the flux may briefly exceed the High threshold (1000 pfu) at the peak of the diurnal cycle today, and again during day 4 (11th) as a result of weak coronal hole influence from CH72.

The associated 24 hour fluence has fallen below the Active (1e8 integrated pfu) threshold and is expected to remain below through the forecast period, although with a rising trend through day 4 (11th). The Met Office REFM model is therefore considering to be giving good guidance.

GEO Electron Environment	Level (cm^{-2} sr^{-1} day^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	≥ 2 MeV ≥ $1x10^8$	Yes	60	30	20	40
Very Active	≥ 2 MeV ≥ $1x10^9$	No	1	1	1	1

Figure 2: Latest Met Office REFM model.



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